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REPORT
OF A
MEETING OF THE
MONTREAL NATURAL HISTORY SOCIETY.

PAPER ON ARSENICAL POISONING.

—DUE TO—

THE COMMERCIAL AND DOMESTIC USES OF
ARSENIC.

RE-PRINTED FROM THE "MONTREAL HERALD" OF JANUARY 19TH, 1886.

AT A MEETING
—OF THE—
Natural History Society of Montreal,

HELD JANUARY 18, 1886,

The President, Sir William Dawson, LL.D., F.R.S., in the Chair,

THE FOLLOWING PAPER WAS READ BY

DR. J. BAKER EDWARDS, F.C.S.,

Public Analyst for the Montreal District of Inland Revenue.

Mr. President and Gentlemen :

The recent outbreak of the epidemic of small pox in our midst, and its vigorous extinction, illustrate most forcibly, firstly, that if the knowledge we possess is practically applied disease may be successfully combatted and stamied out; whereas, secondly, it is equally clear that "prevention" would have been "better than cure," and that had we applied our knowledge at the right time we should have escaped this fatal and injurious calamity. The science of hygiene is directed to the eradication of preventible disease, and should also, I think, cover preventible loss of life by accident or poison; moreover, loss of health should be regarded as next in importance to loss of life. Recent events have called my attention to the careless (if not criminal) use of arsenic sold for domestic purposes as a rat poison, by which eleven persons suffered severe sickness and had their lives endangered in this city, since which a similar case has occurred in Ottawa. Five members of a family residing there had an equally narrow escape while eating their Christmas dinner, from the same dangerous weapon, "Rough on Rats," a poison which contains some 90 per cent. of white arsenic; a box of which is sold by grocers and druggists for 15 cents, containing enough poison to cause the death of 200 persons. The law regulating the sale of poisons for the Province of Quebec requires the registration of the sale of arsenic and arsenical preparations sold as such, but this substance sold under the "nom de plume" of "Rough on Rats," being "registered trade mark," escapes this restriction. So many accidents arise from its use that some druggists refuse to keep or to sell it, and representations will be made to the Government in consequence of these accidents, which will probably restrict or prevent its sale in the future.

Now that the attention of the public has been called to this subject, I think it may

be useful to sound the alarm in respect of the extensive and dangerously increasing use of arsenic in manufactures, agriculture and domestic clothing and furnishing, as I believe the public generally is unaware of the extent to which families are unconsciously brought into contact with this poison, and thereby become liable to suffer protracted ill-health, or even fatal result. For arsenic is said to have four distinct forms of action, varying with the dose and the mode of administration, and with the susceptibility or idiosyncrasy of the patient. These forms of action are known as:—

1. The acute.
2. The sub-acute.
3. The nervous.
4. The chronic.

As some of these simulate forms of disease in inflammatory action, the real cause is often unsuspected. I propose to bring under your attention the danger arising from the handling of arsenic in

MANUFACTURES, AGRICULTURE AND DOMESTIC
USES.

ARSENICAL MANUFACTURES.

In the smelting of arsenical ores, such as cobalt, nickel, iron and copper, it is well known that the arsenical fumes injuriously affect the health of the workmen so employed; and from the tall smoke stacks or giant chimneys of Glasgow, Lancashire and Cornwall, a prevailing steady wind, or current of air will often carry the smoke containing these fumes over a distance of a mile or two, destroying vegetation by the vapor of oxidized sulphur, and covering hedges, herbage and foliage with a fine white hoar frost of arsenic which proves fatal to sheep and cattle so imprudent or so famished as to partake of it. In the manufacture of shot and of glass, arsenic is an essential ingredient, and is used in large quantities, and the surrounding air is contaminated by the fumes proceeding from these furnaces.

In the manufacture of oil of vitriol from arsenical pyrites, much danger arises, inasmuch as the arsenic remains dissolved in the acid and may thus pass into the salts made therefrom; thus Epsom Salts has been found to contain arsenic due to impurity, and hydrochloric or muriatic acid frequently contains arsenic from the same source.

A case of extensive poisoning occurred in London a few years since, arising from the use of arsenical muriatic acid in the manufacture of bread by Dr. Dagliesh's process, for which reason cream of tartar is now generally substituted in baking powder and in self raising flour.

In cases, however, where acid phosphates are substituted for cream of tartar, a danger of the presence of arsenic from the use of impure sulphuric acid still exists.

I am glad, however, to be able to state that after the examination of a large number of samples of bread, baking powder, flour and other bread-stuffs, I have not found any such contamination in the Montreal district.

AGRICULTURAL USES.

Another source of danger arises, especially in country districts, from the free use of arsenic and arsenical poisons, such as "Paris Green" and "London Purple" for the prevention of smut in seed wheat and for the destruction of the potato bug, sheep tick, and other noxious insects. The quantity sold throughout the country for this purpose is enormous, and leads to its careless handling. This applies especially to "Paris Green," which is sold in bulk by country store-keepers to farmers and their households.

Much loss of poultry and cattle has ensued from this carelessness and some loss of life. Its free use in England has led to much crime and accident, as the published record for five years ending 1880 shows.

During this period sixty-seven deaths were registered as due to arsenic; of these 28 were suicidal, 2 were cases of murder and 37 due to accident or negligence, viz., in fact preventable.

The unrestricted sale of arsenical poison and its careless and superabundant use in country districts has often affected green crops, such as cabbage, spinach and small fruits, so as to cause illness to those using these fruits and vegetables; but the evil extends beyond this, and will, if persevered in, poison the streams, percolate into the wells, and thus be a source of fatal loss both of man and beast. This danger also arises from the use of arsenical soap for sheep washing (before shearing) in streams and brooks, and I am of opinion that

these arsenical poisons should only be sold in sealed packages or boxes, fully labelled with directions for use, and never supplied in bulk to the farmer.

DOMESTIC USES OF ARSENIC.

I now pass on to the principal subject of interest to you, viz., the danger of arsenical poison from its domestic uses:—

1st. Its use as a poison for vermin is attended with danger, especially in the disguised form of "Rough on Rats." Equally so in the form of "white arsenic," which is liable to be mistaken for cream of tartar or any other white powder, and mixed with flour may enter into the family meal by oversight; or find its way into malicious hands and tempt to crime, for there is nothing so fatal as opportunity.

2nd. But even arsenical food is a remote danger as compared with the risks we frequently and unconsciously run of inhaling or absorbing arsenic from arsenical pigments in water tints and wall papers, also from clothing but little suspected, such as red flannels, red maroon and brown stockings, etc., etc.

In the last report of the "Massachusetts State Board of Health," the following are enumerated as among the "principal sources of domestic poisoning":—

Wall papers, glazed papers for wrapping confectionery, patterns and cards for children in Kindergarten schools, theatre and concert tickets, playing cards, covers of paper boxes, colored labels and glazed pamphlet covers, clothing, and cretonnes for furniture, glazed calico curtains, paper collars and cuffs, lining of hats, artificial flowers and leaves, children's toys, colored confectionery, aniline dyes, "German fly paper," "papier moure," "carpet moth poison," pile carpets, kamptulicon and oil cloths. It is also frequently used in laundry starch, paper hangers' paste, calendered cotton and glazed linens.

DANGER OF WALL PAPERS AND "TINTS."

Dr. Alfred Swain Taylor, the eminent toxicologist, in his evidence before the House of Lords in 1857, first directed the attention of the medical profession to the numerous cases of chronic poisoning by arsenic from the use of wall papers, especially those flock papers of a green and red color, from some of which he obtained as much as 14 and 17 grains of arsenic per square foot, and from some heavy flock papers even 59 per cent by weight of arsenic. In a damp and drying condition these papers generate and emit arseniuretted hydrogen (Arsenide of Hydrogen) gas, containing 1 grain of arsenic per cubic inch.

At the time of Dr. Taylor's publication some eminent medical men doubted the possibility of grave effects proceeding, as supposed, from so minute a cause; but,

their own experience afterwards proved to them the correctness of Dr. Taylor's assertions and further experience disclosed a far more extensive amount of suffering from this cause than had been previously supposed. Thus, Dr. Hinds, Dr. Halley, and Dr. Saunders Bruton experienced these effects in their own persons or families, and on removal of the obnoxious paper soon recovered health, and then became active supporters of Dr. Taylor's views.

In 1879 Mr. Jabez Hogg, author of a popular work on the microscope, presided over a committee of inquiry appointed by the Medical Society of London. He states in an interesting brochure on the subject published in the "Journal of Science" for last September (a reprint of which our friend, Mr. E. Murphy, has presented to the library), as follows:

"In a few weeks, no less than fifty-four cases of poisoning from arsenical wall papers were reported to the committee, twenty-four of these being from the families of medical men! And the difference in the symptoms described, showed how difficult is the diagnosis of such cases where poison is not suspected, as different individuals show different degrees of susceptibility and varying symptoms, one person complaining of chronic sore throat, another of inflamed eyes, and a third of nervous prostration. Some are immediately relieved on a change of atmosphere, and the symptoms only recur on returning to the vitiated room. Others suffer from nasal catarrh chiefly and get chilled in the open air.

ANECDOTE OF THE QUEEN AT OSBORNE.

Mr. Hogg relates the following anecdote of the famous water color artist, Mr. E. H. Corbould, as an illustration of the "highly susceptible" class of patients:

Mr. Corbould was executing a special work for the Queen at Osborne, and took rooms at an hotel near the palace. His bedroom was damp and the green wall paper much discolored, and he suffered, after passing two nights there, from what he thought a very severe cold in his head. "Her Majesty, on hearing of his illness, gave instructions to an attendant to see to his removal to Victoria Cottage, close to Osborne, and to see that there was a good fire in his bedroom and plenty of wraps. He found, accordingly, on his arrival, a warm room, a cheerful fire, and every comfort." After partaking of a little hot brandy and water, he gladly crept into bed, but in a few minutes felt a chill and was glad to pile on another blanket, but in vain, his teeth fairly chattered, sleep was out of the question. He then bethought himself of his well-lined Spanish cloak and made an effort to reach it; to his horror he could not move either arms or legs, he was

paralyzed! He tried to get out of bed, which produced a painful cramp of the bowels, which was immediately followed by sickness, soon after which he lost consciousness, and remembered no more of what had occurred. At 8 p.m. next morning, he was awakened by a loud knocking at the door, and was scarcely able to say "Come in," and ask for a cup of tea. In a few minutes the servant returned with the tea, and pulled up the blind, he then opened his eyes, and seeing the brilliant green of the bedroom paper, exclaimed, "I am poisoned," to the great consternation and surprise of the servant. He explained that he did not refer to the tea, but to the paper, and she left him, wondering still more. On attempting to get out of bed, his legs gave way under him, but he staggered to the window and inhaled the fresh air, which soon restored him, and he was able to walk up to the Castle. By the time he arrived every disagreeable symptom had vanished.

The Queen was waiting for him, and remarked that he was late, on which he admitted his illness, described his attack, and stated that he had been poisoned by the wallpaper in his bedroom.

Her Majesty expressed great sympathy, and at once commanded an attendant to have a piece of the paper stripped from the wall and brought to her. This was submitted to chemical analysis and found to be "highly arsenical."

"This interesting case," says Mr. Hogg, "shows the extraordinary susceptibility of some persons to arsenical poisoning from this source. The remarkable activity of the toxic agent may have been greatly promoted by the temperature of the room and by the fact of its having been now occupied for the first time since repapering and painting.

The poison doubtless entered the circulation through the lungs in a gaseous form [hydrogen arsenide], thus producing anæsthesia, arrest of the heart's action and paralysis of the nervous centres.

In some cases coma and death has ensued from the same cause.

In the greater number of cases arsenical poisoning takes place slowly and insidiously; it begins with headache, dry cough, oppressed breathing, giddiness and sleeplessness; the limbs are painful, feeble, trembling and benumbed.

In other instances it attacks the surface of the body, causing chronic skin disease, or the fingers and arms are covered with painful sores.

In an establishment where a hundred young girls were constantly employed making artificial flowers and leaves, the greater number of them suffered from eruptions and painful cracking of the skin

of the fingers, and flexures of the arms. Twenty-six of them presented other symptoms of chronic poisoning, and one died after months of great suffering from ulcerations attacking various parts of her body.

Workmen, while engaged in stripping off old wall papers, containing arsenic, from rooms, are frequently attacked with diarrhoea, and other stomach derangements.

Hundreds of instances of dangerous illnesses have been published from time to time, which fully confirm the reckless use of arsenical pigments in various manufactures and the dangers arising therefrom. Scheele's Green consists of one part arsenious acid, two parts oxide of copper. Schweinfurt, Brunswick and Vienna, or Emerald green and Paris green are aceto-arsenites of copper. They are all equally as poisonous as white arsenic.

In wall paper printing the arsenical pigment is mixed with zinc and some organic matter, causing it to adhere to the paper, muslin or calico, and on becoming dry the pigment falls about as arsenical dust. Formerly the use of arsenic was confined to green papers, but since the danger of these has been exposed, green papers are made equally brilliant, containing no arsenic. These, however, often contain Prussian blue and chromate of lead, which, though less poisonous than arsenic, are apt also to fall off in dust and are unwholesome materials to be inhaled in this form.

In the binding of Dr. Draper's article on green papers, published in the State report of Massachusetts for 1872, with samples pasted therein in small stripes, it was found necessary to discontinue the issue of these samples, as the papers injuriously affected the binders of the volume during the short period of handling them.

These contained 50, 70 and 264 grains respectively of arsenical poison to the square yard of paper. The papers exhibited in the 1884 report by Prof. E. T. Wood contain few green pigments, but other colors such as pink, drab, red and grey, are found to be arsenical, yielding from 1 or 2 grains up to 50 or 60 grains per square yard of arsenic.

Thus arsenic is found in glazed and wall papers and cards of every tint, and may also be found mingled with lead in white enamel glaze on cardboard.

FABRICS.

Woollen goods are frequently dyed with arsenical, fuchsine or aniline dye. Glazed calicoes frequently contain it in the facing. Muslin and tarian used for mosquito curtains and for covering provisions and picture frames, both green and yellow, frequently contain a considerable quantity

of this poison. These should be well washed before use, as the dust is most irritating to the eyes, and will surely be distributed about the room.

ARSENICAL CARDS.

A case is also recorded by Mr. Hogg of a lady who suffered painful soreness of the tips of her fingers extending to the roots of the nails, the tenderness always increasing after playing cards, an amusement of which she was very fond, and she usually preferred green backed cards. By shuffling the cards, and holding them in the warm moist fingers a considerable quantity of the arsenical pigment may be detached and absorbed in the course of an evening.

The discontinuance of the use of cards soon caused a disappearance of these symptoms and the cause was discovered and avoided.

In one case upon analysis it was found that each card contained 0.126 grs arsenic, equal to $6\frac{1}{2}$ grains to the pack.

In another case each card contained 1.6 grs. equal to 83 grs. of arsenic and 47 grs of oxide of copper to the pack.

ARSENICAL BOOK COVER.

A curious case is narrated by Dr. Wood, of a child in Troy, N. Y. State, who made a paint palate of a pamphlet with a bright green cover, on which he mixed his colors, using a camel's hair brush, which he naturally, frequently transferred to his lips. The paints were non-arsenical, but unfortunately the bright green cover of the book was highly so, and upon being thus moistened was washed off and absorbed by the lips and tongue. The quantity of arsenic must have been very minute, but circumstances were favorable for absorption, and the child highly susceptible, for, ere he had finished his amusement, he fell into successive convulsions, and, though antidotes were at once administered (the paints being suspected) he suffered severely for three days, and, only by incessant labor, did the physicians save his life. On investigation of the source of the poison, the offending pamphlet, strange to say, was found to be the annual report of the New York Society for the Prevention of Cruelty to Children encased in this pretty green poison-trap cover.

ARSENICAL GLOVES.

A gentleman, travelling, purchased in Hamburg a pair of marine blue gloves. His hands, which became warm, absorbed some of the arsenical pigment, and were soon covered with a peculiar eruption, and he suffered from general weakness. The gloves contained a considerable quantity of arsenic.

ARSENICAL RED STOCKINGS.

A gentleman purchased stockings dyed with aniline red, in New York, and

travelled to Chicago, wearing these through the night. He felt a tingling sensation in the hollow of the foot, which increased, and sores opened about the ankle and calf of the leg. He applied to Dr. Hurlburt, of Chicago, who at once pronounced it to be due to the poisonous dye, and stated that he had had fifty similar cases within the previous three months.

The gentleman was confined to bed for ten days, but it was six months before he entirely recovered from the ill effects.

ARSENICAL CAMBRIC.

A lady who purchased a dress, warranted to wash and to be "Foulard cambric," with narrow strips of light and dark blue, having worn the dress daily for a week in warm weather, suffered from sickness, debility, pain in the stomach, and inflammation of the eyes. The dress, on analysis, was found to contain one-half grain of arsenic to the square foot.

ARSENICAL FLY PAPERS.

Several fatal cases are recorded of children who have tasted the paper or the water set for flies. As this paper contains a very soluble salt, viz., arsenite of soda, it is highly poisonous, causing convulsions and death in a few hours.

ARSENICAL TOYS.

The attraction of bright colors to the eye of the child is well known to the toy maker, and oftentimes induces an excess of pigment, of an injurious character, but when we reflect how often these pretty things find their way into the teething baby's mouth, we recognize the importance of excluding arsenic and chrome yellow from these pigments. Arsenic has been found in toy paints, building blocks, India rubber dolls, covers of picture books, and toy candles.

The latter, used for Christmas trees, are especially dangerous, as the arsenic is diffused into the room during burning in the gaseous form, and is inhaled by the lungs. A box containing 50 such candles has been found to contain 35 grains of arsenic. Arsenic is also an ingredient in the wicks of self-consuming patent candles.

ARSENICAL SWEETMEATS.

I am glad to be able to state that the use of mineral pigments in fancy sweets has almost become a thing of the past. I have examined a large number of every class of sugar sweets and have met with no case of arsenical or lead pigment in this district; and the fact of an inspection being regularly made, has had the effect of improving the general quality of this class of food.

I remember a sad case which came under my notice in Liverpool. Five children were left by their parents

on Christmas Day with a large parcel of sweetmeats, of which they all partook; one child died in 12 hours, a second, at about 3 years of age, in 24 hours; a third, about 5 years old, in a week. The two survivors were taken to the hospital and recovered, the boy continuing to pass arsenical urine, at recurrent intervals, for six weeks after taking the sweetmeats.

STUFFED BIRDS AND ANIMALS.

It should be borne in mind; that arsenic soap is largely used in the preservation of the skins of animals and birds, and that mounted specimens should be enclosed in glass cases and not handled. Children should not be allowed to play with them, or servants to dust them, as much arsenical dust may be brushed from them, which might prove injurious to health. The art of taxidermy is by no means a healthy occupation, and although some men become inured to the poison by use, still, in dressing a large skin, such as a cariboo's or a bear's skin, the operator usually suffers more or less from arsenical symptoms.

ARSENIC EATING IN STYRIA.

The workers in arsenic mines and some of the Styrian peasants become inured to habitual doses of arsenic, which would be fatal to those unaccustomed to its use, four to five grains being a daily dose, but they feel the usual irritating symptoms if they cease using it, like the opium eater and the coca chewer, they find it necessary to continue the habit when once formed.

It is said that the corpses of these arsenic eaters are wonderfully preserved in the ground after interment, and that they are found almost unchanged and recognizable in feature some years after burial. "In this part of the world," they say, "when a graveyard is full it is shut up for about 12 years, when all the graves which are not private property are dug up, the bones are collected in the charnel house, the ground ploughed over, and burial begins again."

EMBALMING THE DEAD.

This leads me to the subject of embalming, which has recently become a special art of the undertaker. The process consists of the injection into the veins of the body a strong arsenical solution. In one case I know this led to an unjust suspicion of poisoning, and an inquest being held, and an analysis made, arsenic was found injected into the coats of the stomach. In this case the process was adopted without instruction and unknown to the relatives, and might have involved serious complications, had the source of the poison remained undiscovered.

A disinterment for the purpose of determining the presence of poison might under such circumstances have led to very erroneous conclusions.

LEGISLATION REQUIRED.

Now, if I have in the foregoing narration made out a strong case against the unnecessary and careless use of arsenic and arsenical poison, I dare say you will ask me, "Well, what are you going to do about it?" I reply that I think in many of the cases the use of arsenic should be prohibited altogether, and that in all cases it should be regulated. Also that the public should be made fully aware of the risks which they incur in its handling, and take due precaution in so doing.

On the continent of Europe strict laws are enforced; for example in Germany:—

1st. Poisonous colors are forbidden to be used in food or drink.

2nd. Articles of food must not be kept or cooked in vessels covered or coated with poisonous material.

3rd. Poisonous color is forbidden in the manufacture of toys, paper-hangings and articles of apparel.

4th. The sale of such articles is strictly prohibited.

IN RUSSIA.

The importation from abroad as well as the sale and manufacture in Russia of wall papers, light tissues, wrapping papers, children's toys, articles of food and sweetmeats containing arsenical pigments, also the paper known as "papier nacre" shall be prohibited. The list of prohibited colors contains pigments of lead, mercury, arsenic, cobalt, copper, chromium and antimony.

IN SWEDEN.

The prohibitory law enumerates the above and "other articles in water colors:—excepting such as shall contain a mere trace of arsenic from 50 square inches."

The same prohibition applies to "stuffs textiles yarn, lamp shades, sealing wax, wafers, candles, and other substances, with the similar exception of minute traces only.

IN AUSTRIA.

A decree was issued in 1876, prohibiting the use of aniline colors of every kind, in food and in fabrics, to be worn in contact with the human body, also of mineral waters containing arsenic, copper, lead, zinc and other poisonous metallic preparations.

In Baden, Bavaria, Denmark, Hesse Darmstadt and Saxony, similar regulations have been made. In France and England and the United States these regulations only apply to articles of food and drink, but vigorous efforts are being made by sanitary reformers to extend these prohibitory regulations to the class of articles which experience has proved to be dangerous to the health and lives of the community at large, a course which I venture to think Canada would do well to adopt.

Dr. T. Sterry Hunt remarked that he had been much interested in the variety of information which was embraced in Dr. Edwards' valuable paper.

It occurred to him that when he had visited gold mines in the west, where arsenical pyrites are worked, to enquire what became of all the arsenic, and he found that this was accumulated to the extent of hundreds of tons, and efforts had been made to get rid of it by mixing it with superphosphate of lime in manure for the purpose of destroying burrowing insects, but even this did not make much demand on this large accumulation. He also enquired whether it affected the health of the workmen, and this was admitted, but it was stated that they became inured to it, or if much affected ceased this employment, and the local irritation produced was relieved by poultices of oxide of iron, which appeared to be the best antidote to its effects.

Mr. R. W. McLachlan enquired if it poisoned grubs in the ground would it not also kill the earth worms which were now reckoned the most important subsoil fertilizers. Dr. Hunt said he was afraid the earthworms had been left out of the calculation, but as a geologist he would not like to lose them and perhaps if they were poisoned the birds who lived upon them would also be destroyed and the face of nature would be changed for the worse. Large quantities of arsenic in the soil would certainly be dangerous to water sources.

Dr. Wanless expressed of the paper from which he got a great deal.

Prof. Penballow said some diseases come under his notice which he believed that skin eruptions from dyed underclothing were more common than usually supposed. He also believed that certain brands of cigarettes called "sweet" contained either arsenical paper or some other poison which caused a specific sore throat or ulceration of the lips, and he would direct Dr. Edwards' attention to this source of poison. He hoped Dr. Edwards would publish his paper in the Record of Science.

Sir Wm. Dawson, in moving thanks to Dr. Edwards for his contribution, said it was a practical and valuable paper, and he hoped it would be published in the *Record* and have influence with the Government in adopting proper restrictions on the sale and use of such dangerous poisons.

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